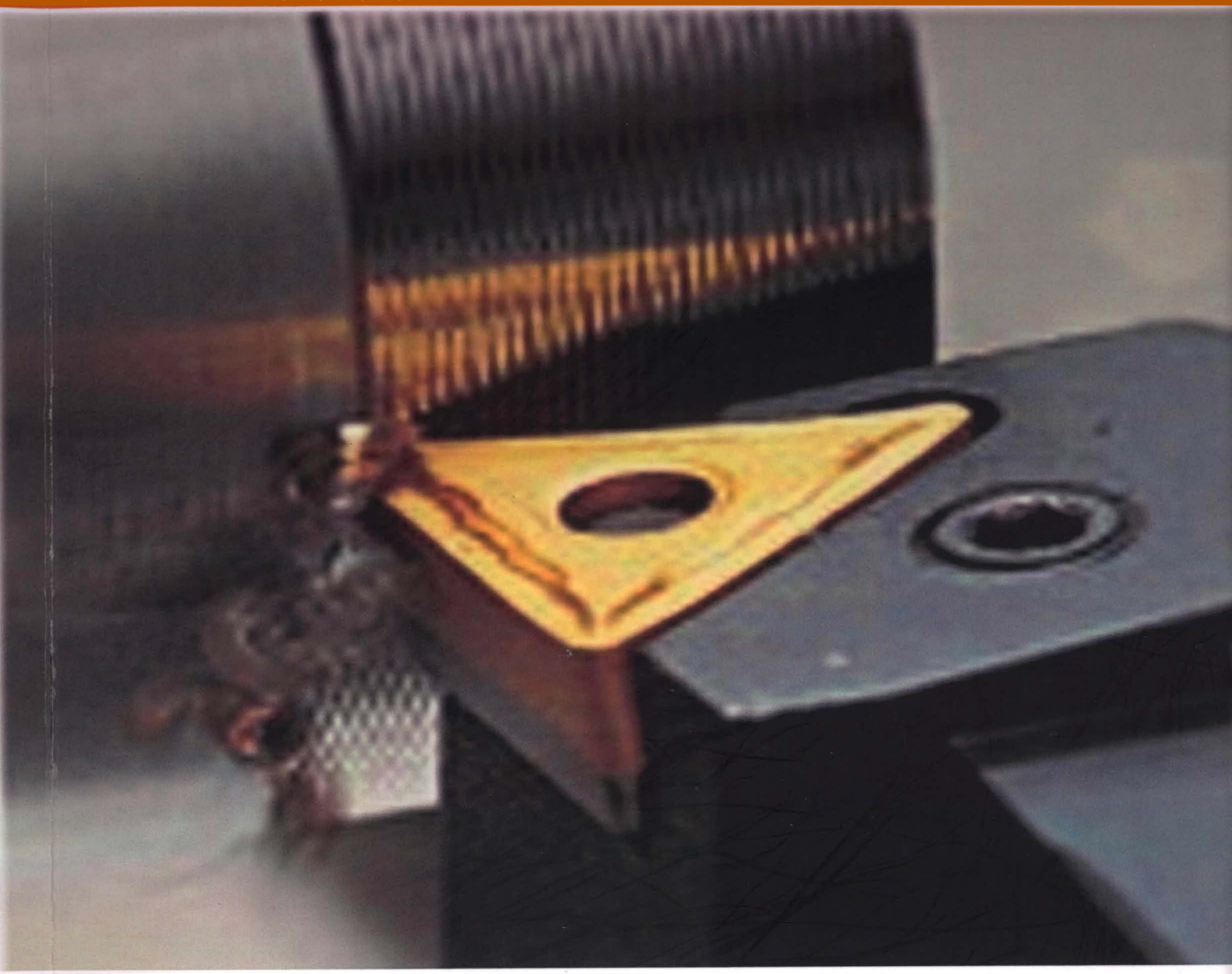

EDITOR

ERRY YULIAN TRIBLAS ADESTA

HIGH SPEED CUTTING

An Approach towards Improved Machining Performance

Manufacturing and Materials Department

Kulliyyah of Engineering

International Islamic University Malaysia

2011

HIGH SPEED CUTTING

An Approach towards Improved Machining Performance

EDITORS
ERRY YULIAN TRIBLAS ADESTA
AMIR AKRAMIN SHAFIE
AGUS GETER EDY SUTJIPTO
WAN AHMAD YUSMAWIZA

IIUM Press

Published by:
IIUM Press
International Islamic University Malaysia

First Edition, 2011

Perpustakaan Negara Malaysia Cataloguing-in-Publication Data

Erry Yulian Triblas Adesta, Amir Akramin shafie, Agus Geter Edy Sutjipto & Wan Ahmad Yusmawiza: High Speed cutting An Approach towards Improved Machining Performance

ISBN: 978-967-418-023-2

Member of Majlis Penerbitan Ilmiah Malaysia – MAPIM
(Malaysian Scholarly Publishing Council)

Printed by :
IIUM PRINTING SDN.BHD.
No. 1, Jalan Industri Batu Caves 1/3
Taman Perindustrian Batu Caves
Batu Caves Centre Point
68100 Batu Caves
Selangor Darul Ehsan
Tel: +603-6188 1542 / 44 / 45 Fax: +603-6188 1543
EMAIL: iiumprinting@yahoo.com

CONTENTS

Chapter Three – Development of Empirical Models for Surface Roughness during High Speed Turning for Hard Materials using Box-Behnken Design

Mohammad Yuhan Suprianto [1] and Erry Yulian Triblas Adesta [2]
1, 2. Faculty of Engineering – International Islamic University Malaysia
✉ : yuhan.suprianto@gmail.com / ✉ : eadesta@iium.edu.my

PART II: MOVING TOWARDS HIGH SPEED CUTTING

Chapter Four – Surface Roughness Prediction Model of Hardened AISI H13 in High Speed End Milling Operation

Afifah Mohd Ali [1] and Muhammad Riza [2]
1,2. Kulliyyah of Engineering, International Islamic University Malaysia
✉ : sakisakura@gmail.com / ✉ : muhammadriza@yahoo.com

Chapter Five – Sample Preparation on Ceramics Composite for Cutting Tools in High Speed Machining

A.G.E. Sutjipto[1], A. Kaderi [2]
1,2, Kulliyyah of Engineering, International Islamic University Malaysia
✉ : agus@iium.edu.my

Chapter Six – Influence of Backcutting Phenomena to Surface Roughness of Hardened AISI H13 during High Speed End Milling Process

Afifah Mohd Ali[1] and Erry Yulian Triblas Adesta[2]
Kulliyyah of Engineering, International Islamic University Malaysia
✉ : sakisakura@gmail.com / ✉ : eadesta@iium.edu.my

Chapter Seven –Experimental Investigations in High-Speed Hard Turning of AISI 4340 Steel Using Mixed Ceramic

Muataz Al Hazza[1] and Erry Yulian Triblas Adesta[2]
1, 2. Faculty of Engineering – International Islamic University Malaysia
✉ : mutaz_hazaa@yahoo.com /✉ : eadesta@iium.edu.my

PART III: IMPROVED PERFORMANCE OF HIGH SPEED CUTTING

Chapter Eight – Coating For High Speed Cutting Tools

Suryanto
Kulliyyah of Engineering, International Islamic University Malaysia
✉ : surya@iium.edu.my

Chapter Nine – Development of Tooling Cost Model in High Speed Hard Turning

Muataz Al Hazza[1] and Erry Yulian Triblas Adesta[2]
1, 2. Faculty of Engineering – International Islamic University Malaysia
✉ : mutaz_hazaa@yahoo.com / ✉ : eadesta@iium.edu.my

Chapter Ten – Development of New Model for Cutting Force in High Speed Hard Turning

Muataz Al Hazza[1] and Erry Yulian Triblas Adesta[2]
1, 2. Faculty of Engineering – International Islamic University Malaysia
✉ : mutaz_hazaa@yahoo.com /✉ : eadesta@iium.edu.my

Chapter Three

Development of Empirical Models for Surface Roughness during High Speed Turning for Hard Materials using Box-Behnken Design

Muataz Al Hazza[1] and Erry Yulian Triblas Adesta[2]
1, 2. Faculty of Engineering – International Islamic University Malaysia
✉ : mutaz_hazaa@yahoo.com / ✉ : eadesta@iium.edu.my

3.1 Introduction

Grinding is the final stage of most of machining products but grinding is time consuming process. The best alternative for grinding is by hard turning. Hard turning has emerged since modern cutting tools such as ceramics were available to reduce the time needed to finish hardened parts those with hardness ranging from 45 to 70 HRC. The secret to successful hard turning is by higher cutting speed because hard turning processes are usually associated with high temperatures. In high speeds, heat goes out with the chip and not into the tool or the work piece, so the wet cutting becomes useless.

The term high speed may not be the same for different materials, high speed for one material may be a low speed for another (for example, the high speed for titanium is a low speed for aluminum). Another sign for the high speed is the chip shape. The chips produced under various cutting speeds have different shapes. At low cutting speeds the chip is a continuous type but when the speed is increased, it is changed to saw-tooth type (Lin et. al., 2008: Sharma, 2001).

Many researchers studied the effects of the cutting parameters on surface roughness in hard turning.

Benga and Abrao (2003) found that feed rate was the most significant factor affecting surface finish while cutting speed has very little influence on surface finish for both ceramic and CBN cutting tools when machining hardened 100Cr6 bearing steel 62–64 HRC.